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SPECIFICATION FOR MIRROR STEREOSCOPE

(*First Revision*)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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Indian Standard

SPECIFICATION FOR MIRROR STEREOSCOPE

(First Revision)

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Indian Standard

SPECIFICATION FOR MIRROR STEREOSCOPE

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 18 November 1986, after the draft finalized by the Optical and Mathematical Instruments Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 Mirror stereoscope is a portable instrument for stereoscopic examination of stereo/aerial photographs.

0.3 This standard was originally published in 1978. In this revision the clauses pertaining to parallax bar (stereometer) have been deleted. The requirements of parallax bar (stereometer) have been covered in IS : 11445-1985*.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the general and functional requirements of a mirror stereoscope.

2. TERMINOLOGY

2.1 For the purpose of this standard, the following definitions and those given in IS : 1399-1959‡ shall apply.

2.1.1 *Stereoscopic Vision* — The observation of an object or objects under conditions which present a different image to each eye to produce a solid or three dimensional effect.

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*Specification for parallax bar (stereometer).

†Rules for rounding off numerical values (*revised*).

‡Glossary of terms used in optical technology.

2.1.2 *Stereogram/Stereograph* — A pair of photographs or transparencies with record of two images of an object from two different angles which may be fused stereoscopically to show the object in relief or three dimensions.

2.1.3 *Stereoscope* — An instrument which reveals the contours in relief and presents a solid or three dimensional view of the object.

2.1.4 *Stereoscopic Aquity* — The ability of eyes to resolve and see as such the objects which are at varying distances from the observer.

2.1.5 *Fusion of Images* — Merging 'generally by stereoscope' of two images of the same object in a pair of stereograph so as to form a distinct single object in relief.

2.1.6 *Binocular Parallax* (*Differential Parallactic Angle*) — The difference in the angle subtended at the two eyes of a person by two different objects situated in space. This enables perception in depth.

2.1.7 *Binocular* — Two telescopes of identical optical characteristics joined together to form a single instrument which presents to both eyes a magnified stereoscopic view of the objects.

3. GENERAL REQUIREMENTS

3.1 The mirror stereoscope (*see* Fig. 1) shall have a rigid main frame to which shall be rigidly fixed the reflector frames. The reflector frames shall have carrying handles. The reflector frames shall carry four foldable legs. The legs shall have rubber cushion pads. One of front legs shall be adjustable to make the stereoscope stable on a not perfectly plain surface. The mirror surfaces shall be inclined at 45° to horizontal and symmetrically disposed. The prism housings shall be rigidly fixed to the frame. Two magnifying lenses shall be provided in mounting so that they may be swung by knobs between the mirrors and the prisms for viewing at magnification 1·2 × and may be swung out for direct viewing or viewing with binocular viewer.

3.2 The binocular viewer shall be a detachable unit. Its locating rod (*see* Fig. 2) shall have flats machined over it on opposite sides at an angle of 45° to the base of the binocular viewer. The boss on the stereoscope (*see* Fig. 2) shall have a vertical slit through which the locating rod may be inserted. For direct viewing or viewing at magnification 1·2 × the binocular viewer may be swung/away from the examiner and shall rest on rubber pads on the frame. For the binocular viewing the positioning pins (*see* Fig. 2) on the base of the binocular shall sit on the recessed flat seat of the main frame. In this position the binocular viewer eyepieces shall be inclined at 45° to the horizontal. The ocular distance shall be adjustable preferably with the help of a knob and the movable plates

(*see* Fig. 1) of the binocular shall move in dovetailed grooves. The movable plates shall be connected to pins on the rotatable disc (*see* Fig. 2) such that the two plates shall move towards or away from each other simultaneously and symmetrically. A scale mounted on top of the binocular viewer base plate shall indicate the interocular distance in mm, mark on or edge of one of the moving plates being used as a pointer.

3.3 Materials

3.3.1 The optical glass used for the optics shall conform to the requirements of IS : 1400-1960*.

3.3.2 Optical components used shall conform to the requirements of IS : 988-1959†.

3.3.3 The materials used for the manufacture of mechanical parts shall be strong but light in weight, of good quality and free from flaws and defects.

3.3.4 Lubricants, greases, lutings, comments, paints used shall be of approved quality and shall be suitable for operation in the temperature range of —10° to +55°C and 95 percent relative humidity.

3.3.5 Unpainted steel components and metal parts likely to corrode due to electrolytic reaction between contacting dissimilar metals shall be chromium-plated.

4. FUNCTIONAL REQUIREMENTS

4.1 The mirror stereoscope shall provide magnification and field of view as given below:

	Magnification	*Minimum Field of View*
a) Direct viewing	—	180 × 200 mm
b) With built-in magnifier	1·2 ×, *Min*	175 mm diameter
c) With binocular viewer	3 ×, *Min*	70 mm diameter
d) With optional additional binocular viewer	6 × or 8 ×	35 mm diameter or 26 mm diameter

The distance between centres of field of view under different magnifications shall not be more than 20 percent of the radius of the field of view at higher magnification. The magnification shall be marked on the built-in magnifier and the binocular viewer.

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*Specification for optical glass.

†General requirements for optical components.

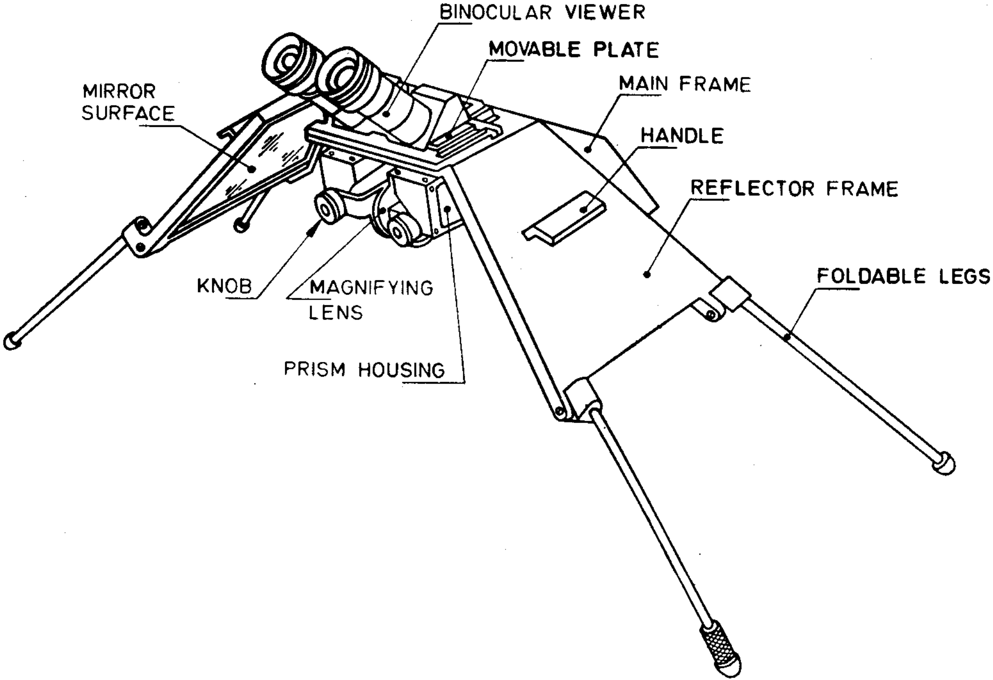

FIG. 1 NOMENCLATURE OF MIRROR STEREOSCOPE

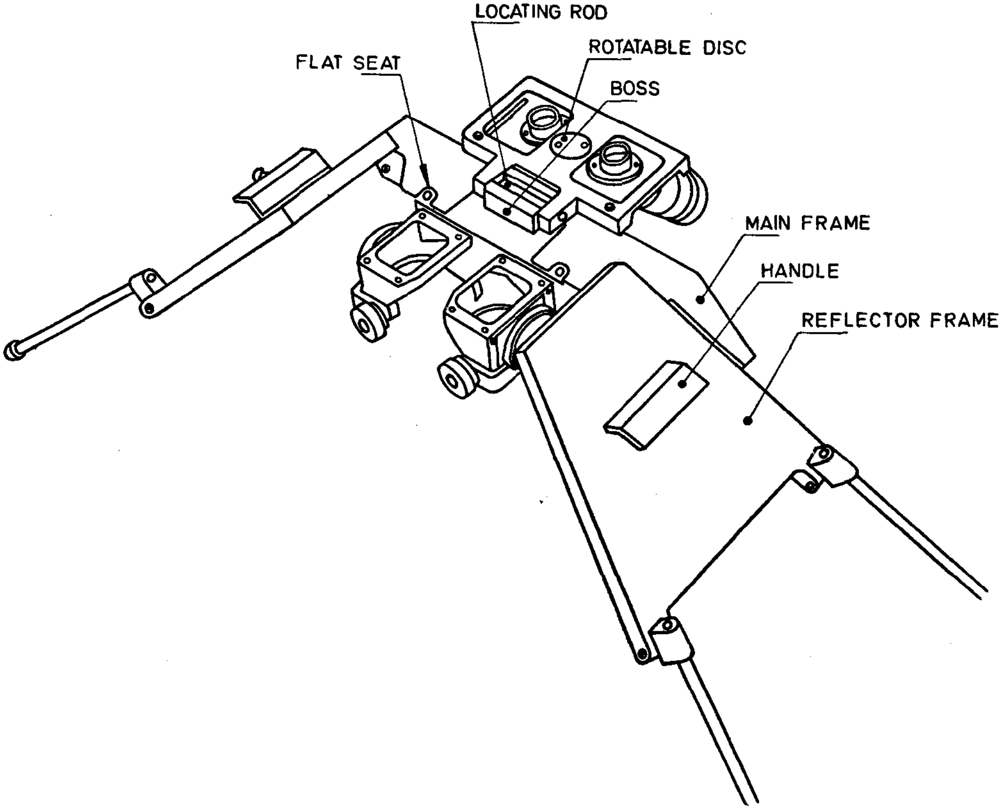

FIG. 2 NOMENCLATURE OF MIRROR STEREOSCOPE

4.2 The binocular viewer shall be detachable type which may also be swung away from the examiner when not required. The binocular viewer shall be so located that there is no side play and it shall rest in a stable position on the main frame of the stereoscope.

4.3 The binocular viewer eyepieces shall be provided with minimum adjustable interocular range of 56 to 74 mm. A scale shall be provided preferably on the right side of binocular to indicate interocular setting in 2 mm divisions.

4.4 The optical axes of the binocular eyepieces shall be parallel. They shall not converge more than six minutes or diverge more than two minutes and the dipvergence shall also be restricted to two minutes.

NOTE — Dipvergence is divergence perpendicular to ocular base of binocular.

4.5 The exit pupil diameter of the binocular viewer shall be 3 to 4 mm and its position shall not be less than 15 mm from the eyepiece glass surface.

4.6 Dioptric settings up to ± 5 dioptres shall be provided in binocular eyepieces. The dioptric scale provided on the eyepieces shall not differ from actual value at any position by more than 1/2 D.

4.7 The mirror shall have aluminium coating on the front surface and shall conform to the requirements of IS : 9514-1980* and shall also have protective coating over the aluminium reflecting surface.

4.8 The mirrors shall be inclined 45° to the horizontal and shall be symmetrically placed with respect to a common central axis.

4.9 The disposition of the mirror shall be such as to give not less than 250 mm separation between identical points on a pair of stereographs.

4.10 The mirror surface and the reflecting prism surface shall be parallel.

4.11 The optical axis of the instrument shall be perpendicular to the base for stereophotographs within one degree.

4.12 Each half of the instrument shall allow the eye to see only one of a pair of stereographs.

4.13 The magnification from the two halves of the instrument shall be equal within ± 2 percent and both parts of the stereoscope shall be balanced to make good stereoscopic fusion.

4.14 The axial transmission of white light through the stereoscope shall not be less than 60 percent and transmission values of the two halves shall not vary by more than 5 percent.

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*Specification for front surface aluminized mirrors.

4.15 The central area of good image quality shall not be less than 2/3 of the field of view.

4.16 The variation in focussing when changing binocular viewers shall not be beyond ± 0·5 dioptre if additional binocular viewer of 6 X or 8 X is provided.

4.17 The reorientation of images when changing magnification from high to low shall be:

a) Shift perpendicular to base line $< 1/M$ mm where M is magnification, and

b) Rotation $<$ 0·5 degree

4.18 The stereoscope, when erected on its legs, shall be rigid and shall be stable against vibration when adjusting eyepieces or changing magnifications.

4.19 The motion of moving parts of stereoscope shall be correctly constrained and yet smooth. The position set shall not shift on its own accord. The workmanship and finish shall correspond to a precision measuring instrument.

4.20 The instrument shall withstand use in field conditions and so shall be protected against dust, humidity and fungus.

5. PERFORMANCE TESTS

5.1 Magnification of the Built-in Magnifier — By looking with one eye through the stereoscope and with the other eye directly on the table, an object of size 1 cm under the stereoscope may be marked or copied with a pencil on a sheet of paper as seen simultaneously by the other eye. If the distance between the unaided eye and the paper is 'X' cm, and copied length 'Y' cm, then the magnification is 25/XY.

5.2 Optical Axis Angle with Perpendicular on Print (*see* **Fig. 3**) — By swinging the apex of the right angle triangle (set square) or a trisquare to and fro, the observation as to whether the line of sight coincides with the side of the set square shall be made. Measurements shall be made for both X and Y direction. The angle between the perpendicular and the optical axis may be calculated as $\tan^{-1}$ (distance between centre of observed area and perpendicular/height of apex of set square).

5.3 The Binocular Viewer — This shall be tested in accordance with IS : 3113-1965* and IS : 2754-1964†.

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*Specification for prismatic binoculars for common use.

†General requirements for optical instrument.

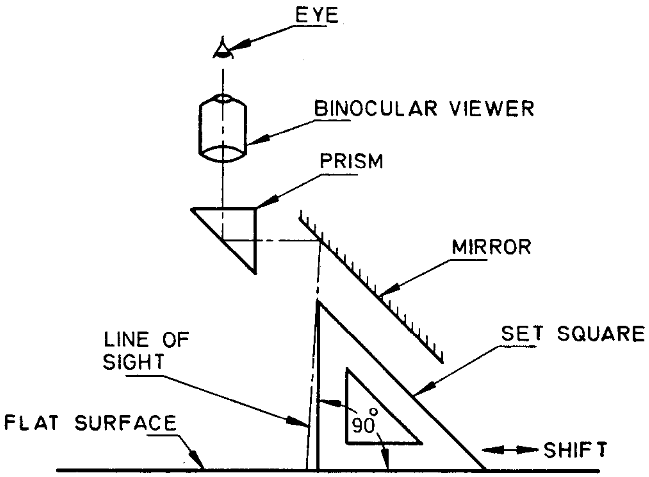

Fig. 3 Test for Optical Axis Angle with Perpendicular on Print

5.4 Symmetry — The following tests shall be conducted:

a) With a large set square, the 45° angles of the mirrors are measurable. Use a plastic set square, preferably a coloured one, and do not touch the mirror surfaces. Estimate the distance between the plastic edge and its mirror image. The distance shall be small and constant (*see* Fig. 4).

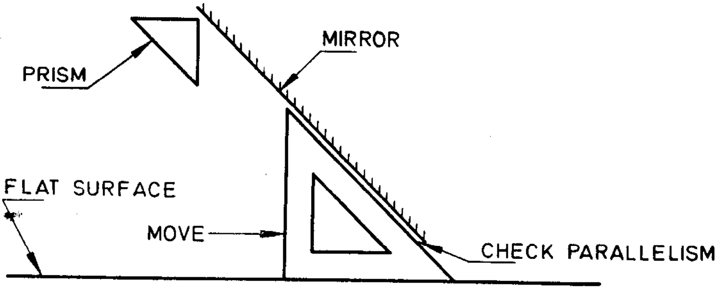

Fig. 4 Test for Symmetry

b) *Parallelism of the Mirror and Prism Surfaces for the Two Halves*— Put the stereoscope on its side on the edge of the table. Get the sunshine into the large mirrors and measure the distance between the two images of the sun, which are formed by the two pin holes. This separation shall be equal to the separation between the two pin holes (*see* Fig. 5).

c) *Image Tilt and Parallelism of the Images*— The images of a plumb line formed by the two halves of the optical system shall be vertical within 1° and parallel within 0·5°.

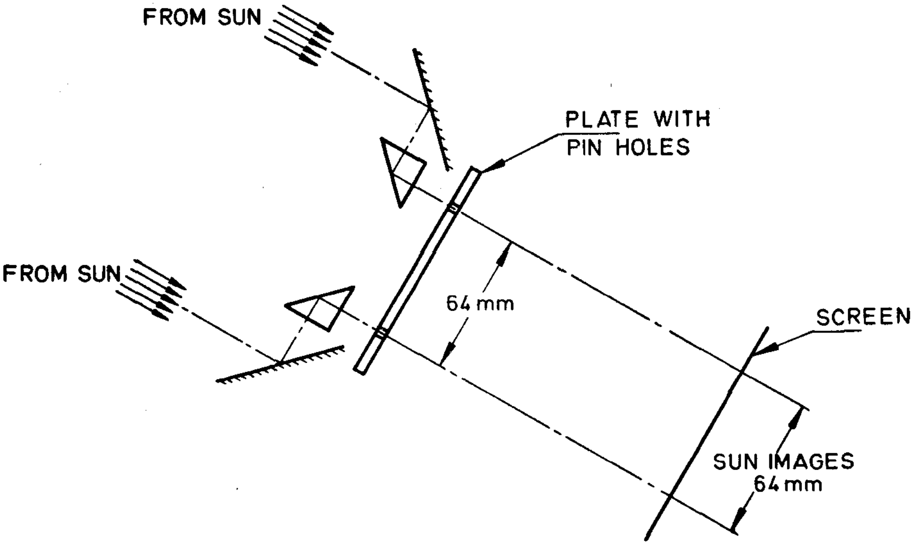

FIG. 5 TEST FOR PARALLELISM OF MIRROR AND PRISM SURFACES FOR TWO HALVES

5.5 Concentricity — The concentricity of fields of view under different magnifications may be determined by drawing the fields of view and determining their centres. The distance between the centres shall not be more than 20 percent of radius of the field of view at higher magnification. While drawing on a sheet of paper under the stereoscope the observation shall be under normal condition without eye strain.

6. MARKING

6.1 Each stereoscope shall be marked with the manufacturer's name or trade-mark.

6.1.1 The instrument may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions, under which a licence for the use of the Standard Mark may be granted to manufacturers or processors, may be obtained from the Bureau of Indian Standards.

7. PACKING AND PACKAGING

7.1 The mirrors shall be provided with protective plastic cover which shall not touch or rub against the mirror surface. Protective plastic cap shall also be provided over the eyepieces.

7.2 The stereoscope shall be suitably packed for storage and transit so that there is no possibility of any deterioration or damage in transit.

7.3 The package shall be marked with the description of contents and with standard symbol for indicating fragile contents according to IS : 1260 (Part 2)-1973* together with the legend 'HANDLE WITH CARE' and also the symbol for 'RIGHT-WAY UP'.

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*Pictorial markings for handling and labelling of goods: Part 2 General goods (*first revision*).